

Location independence in patient monitoring

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Introduction

Hospital patients require physiological monitoring throughout their stay. Monitoring requirements depend on the hospital unit (e.g. Admission, OR, ICU, ward). Currently, monitoring devices are stationary and are connected by wires to sensors and patient. This is cumbersome for both patient and health care providers, and sensors must be disconnected when the patient is prepared for transfer between units. Further, sensors located in one unit are often incompatible with those in another. We propose a novel concept that simplifies patient monitoring throughout the hospital.

Method

Approach: We propose a two level wireless network (Fig. 1). A personal area network (PAN) is private to the patient and is responsible for the control of data communication. The PAN host device connects to all required sensors using a wide range of supported protocols (e.g. serial, USB, WiFi and Bluetooth), and is attached to the patient during the entire hospital stay. The PAN host then wirelessly transmits the standardized data to a local area network (LAN) that records patient health information in a database. This information can be retrieved in real time by either stationary monitoring devices or mobile devices of health care providers throughout the hospital network.

Prototype: The prototype consists of two pulse oximeters (Nonin, USA) connected via Bluetooth and wired connection, respectively, to a computer with a Linux operating system that acts as the host for the PAN. The LAN consists of a server running a web-based sensor actuator network portal called Sense Tecnic [1]. A WiFi enabled mobile device is used as the monitoring display.

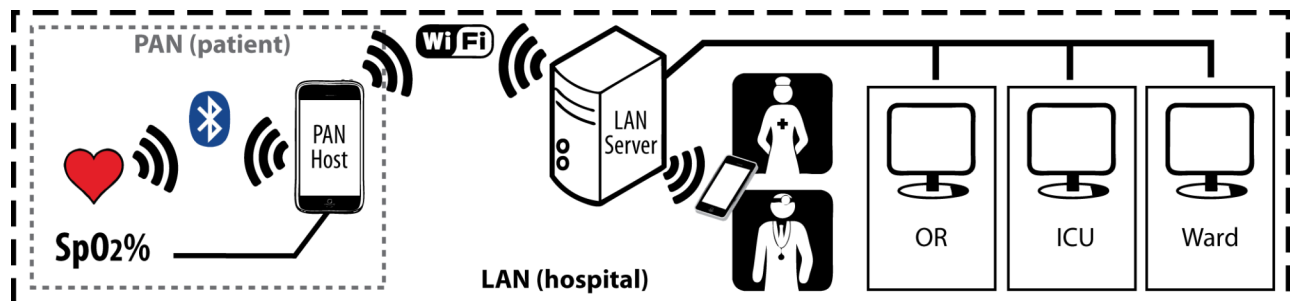


Fig. 1: A personal area network (PAN) monitors the patient and transmits the trend data to a local area network (LAN) where health care workers can access the signals in real-time.

Results & Discussion

Blood oxygen saturation and heart rate trend signals are recorded and displayed in real time at a 1 Hz update rate. The web-based data portal allows platform independent, real-time monitoring. The PAN allows for easy connection of sensors to the patient and facilitates monitoring during patient movement and transportation. This approach will facilitate the use of elementary sensors without interruption throughout the hospital. Unit specific sensors can be added to the PAN when required. Future work will include geolocation by indoor triangulation using the WiFi network, and size reduction of the PAN host.

[1] MAGIC Broker 2: An Open and Extensible Platform for the Internet of Things. M. Blackstock, N. Kaviani, R. Lea, A. Friday. Internet of Things 2010 Conference, 2010, Tokyo, Japan. <http://www.sensetecnic.com>